WHAT IS CLAIMED IS:

1. A telecommunications system, comprising:

a transmitter having an encoder that implements a multi-state trellis code; and

at least two transmission elements coupled to the transmitter,

wherein, during operation, the encoder:

receives a group of input data bits,

selects a particular space-time block code from a set of space-time block codes, based on the group of input bits and a state of the encoder,

selects at least two modulation symbols, one symbol for each of the at least two transmission elements, based on the group of input bits and the state of the encoder, and

encodes the group of input data bits, using the particular space-time block code and the at least two modulation symbols, for transmission by the at least two transmission elements.

2. The system of claim 1, wherein

the at least two transmission elements are antennas.

3. The system of claim 1, wherein

the at least two transmission elements are optical transmitters.

4. The system of claim 1, wherein

the coding gain distance of the multi-state trellis code is maximized.

5. The system of claim 1, wherein

the at least two transmission elements consists of a first and second transmission element, and

the particular space-time block code is an orthogonal space-time block code of a form

$$C(x_1, x_2, \theta) = \begin{pmatrix} x_1 e^{j\theta} & x_2 \\ -x_2^* e^{j\theta} & x_1^* \end{pmatrix}.$$

6. The system of claim 1, wherein

the at least two transmission elements consists of a first and second transmission element, and

the particular space-time block code is an orthogonal space-time block code of a form

$$C(x_1, x_2, \theta) = \begin{pmatrix} x_1 e^{j\theta} & x_2 e^{j\theta} \\ -x_2^* & x_1^* \end{pmatrix}.$$

7. The system of claim 5, wherein

at least two states of the multi-state trellis code use different values of θ.

8. The system of claim 7, wherein

the encoder determines three variables X_1, X_2, and Θ based on the group of input data bits and the state of the encoder,

the encoder sends signal $X_1 e^{j\Theta}$ to the first transmission element and signal X_2 to the second transmission element at a time T_1, and

the encoder sends signal $-X_2^* e^{i\Theta}$ to the first transmission element and signal X_1^* to the second transmission element at a time T_2.

9. The system of claim 8, wherein

the encoder implements a two-state trellis code.

10. The system of claim 9, wherein

space-time block code $C(X_1, X_2, 0)$ is associated with state 1, and

space-time block code $C(X_1, X_2, \pi)$ is associated with state 2.

11. The system of claim 10, wherein

the encoder receives one state bit (B_A) and one modulation bit (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 1, state bit (B_A) equals 0, and modulation bit (B_B) equals 0,

(1, 1, 0) if the encoder is in state 1, state bit (B_A) equals 0, and modulation bit (B_B) equals 1,

(0, 1, π) if the encoder is in state 1, state bit (B_A) equals 1, and modulation bit (B_B) equals 0, and

(1, 0, π) if the encoder is in state 1, state bit (B_A) equals 1, and modulation bit (B_B) equals 1.

12. The system of claim 10, wherein

the encoder receives one state bit (B_A) and one modulation bit (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 2, state bit (B_A) equals 1, and modulation bit (B_B) equals 0,

(1, 1, 0) if the encoder is in state 2, state bit (B_A) equals 1, and modulation bit (B_B) equals 1,

(0, 1, π) if the encoder is in state 2, state bit (B_A) equals 0, and modulation bit (B_B) equals 0, and

(1, 0, π) if the encoder is in state 2, state bit (B_A) equals 0, and modulation bit (B_B) equals 1.

13. The system of claim 10, wherein

the encoder receives one state bit (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 000,

(2, 2, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 001,

(0, 2, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 010,

(2, 0, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 011,

(1, 1, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 100,

(3, 3, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 101,

(1, 3, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and modulation bits (B_B) equal 110,

(3, 1, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 111,

(0, 1, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 000,

$(2, 3, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 001,

$(0, 3, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and modulation bits (B_B) equal 010,

$(2, 1, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and modulation bits (B_B) equal 011,

$(1, 0, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and modulation bits (B_B) equal 100,

$(3, 2, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and modulation bits (B_B) equal 101,

$(1, 2, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and modulation bits (B_B) equal 110, and

$(3, 0, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and modulation bits (B_B) equals 111.

14. The system of claim 10, wherein

the encoder receives one state bit (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

$(0, 1, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 000,

$(2, 3, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 001,

$(0, 3, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 010,

$(2, 1, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 011,

$(1, 0, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 100,

$(3, 2, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 101,

$(1, 2, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and modulation bits (B_B) equal 110,

$(3, 0, 0)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 111,

$(0, 0, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 000,

$(2, 2, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 001,

$(0, 2, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and modulation bits (B_B) equal 010,

$(2, 0, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and modulation bits (B_B) equal 011,

$(1, 1, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and modulation bits (B_B) equal 100,

$(3, 3, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and modulation bits (B_B) equal 101,

$(1, 3, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and modulation bits (B_B) equal 110, and

$(3, 1, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 0, and modulation bits (B_B) equals 111.

15. The system of claim 8, wherein
the encoder implements a four-state trellis code.

16. The system of claim 15, wherein
space-time block code $C(X_1, X_2, 0)$ is associated with state 1,
space-time block code $C(X_1, X_2, \pi)$ is associated with state 2,
space-time block code $C(X_1, X_2, 0)$ is associated with state 3, and

space-time block code $C(X_1, X_2, \pi)$ is associated with state 4.

17. The system of claim 16, wherein

the encoder receives one state bit (B_A) and one modulation bit (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 1, state bit (B_A) equals 0, and modulation bit (B_B) equals 0,

(1, 1, 0) if the encoder is in state 1, state bit (B_A) equals 0, and modulation bit (B_B) equals 1,

(0, 1, π) if the encoder is in state 1, state bit (B_A) equals 1, and modulation bit (B_B) equals 0, and

(1, 0, π) if the encoder is in state 1, state bit (B_A) equals 1, and modulation bit (B_B) equals 1.

18. The system of claim 16, wherein

the encoder receives one state bit (B_A) and one modulation bit (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 2, state bit (B_A) equals 0, and modulation bit (B_B) equals 0,

(1, 1, 0) if the encoder is in state 2, state bit (B_A) equals 0, and modulation bit (B_B) equals 1,

(0, 1, π) if the encoder is in state 2, state bit (B_A) equals 1, and modulation bit (B_B) equals 0, and

(1, 0, π) if the encoder is in state 2, state bit (B_A) equals 1, and modulation bit (B_B) equals 1.

19. The system of claim 16, wherein

the encoder receives one state bit (B_A) and one modulation bit (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

($0, 0, \pi$) if the encoder is in state 3, state bit (B_A) equals 0, and modulation bit (B_B) equals 0,

($1, 1, \pi$) if the encoder is in state 3, state bit (B_A) equals 0, and modulation bit (B_B) equals 1,

(0, 1, 0) if the encoder is in state 3, state bit (B_A) equals 1, and modulation bit (B_B) equals 0, and

(1, 0, 0) if the encoder is in state 3, state bit (B_A) equals 1, and modulation bit (B_B) equals 1.

20. The system of claim 16, wherein

the encoder receives one state bit (B_A) and one modulation bit (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

($0, 0, \pi$) if the encoder is in state 4, state bit (B_A) equals 0, and modulation bit (B_B) equals 0,

($1, 1, \pi$) if the encoder is in state 4, state bit (B_A) equals 0, and modulation bit (B_B) equals 1,

(0, 1, 0) if the encoder is in state 4, state bit (B_A) equals 1, and modulation bit (B_B) equals 0, and

(1, 0, 0) if the encoder is in state 4, state bit (B_A) equals 1, and modulation bit (B_B) equals 1.

21. The system of claim 16, wherein

the encoder receives one state bit (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 000,

(2, 2, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 001,

(0, 2, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 010,

(2, 0, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 011,

(1, 1, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 100,

(3, 3, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 101,

(1, 3, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 110,

(3, 1, 0) if the encoder is in state 1, state bit (B_A) equals 0, and the modulation bits (B_B) equal 111,

(0, 1, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 000,

(2, 3, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 001,

(0, 3, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 010,

(2, 1, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 011,

(1, 0, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 100,

(3, 2, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 101,

(1, 2, π) if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 110, and

$(3, 0, \pi)$ if the encoder is in state 1, state bit (B_A) equals 1, and the modulation bits (B_B) equal 111.

22. The system of claim 16, wherein

the encoder receives one state bit (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

$(0, 0, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 000,

$(2, 2, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 001,

$(0, 2, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 010,

$(2, 0, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 011,

$(1, 1, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 100,

$(3, 3, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 101,

$(1, 3, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 110,

$(3, 1, 0)$ if the encoder is in state 2, state bit (B_A) equals 0, and the modulation bits (B_B) equal 111,

$(0, 1, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 000,

$(2, 3, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 001,

$(0, 3, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 010,

$(2, 1, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 011,

$(1, 0, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 100,

$(3, 2, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 101,

$(1, 2, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 110, and

$(3, 0, \pi)$ if the encoder is in state 2, state bit (B_A) equals 1, and the modulation bits (B_B) equal 111.

23. The system of claim 16, wherein

the encoder receives one state bit (B_A) and three modulation bits (B_B) at a time T_o, and

the transmission variables (X_1, X_2, Θ) equal:

$(0, 1, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 000,

$(2, 3, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 001,

$(0, 3, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 010,

$(2, 1, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 011,

$(1, 0, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 100,

$(3, 2, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 101,

$(1, 2, 0)$ if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 110,

(3, 0, 0) if the encoder is in state 3, state bit (B_A) equals 1, and the modulation bits (B_B) equal 111,

(0, 0, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 000,

(2, 2, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 001,

(0, 2, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 010,

(2, 0, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 011,

(1, 1, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 100,

(3, 3, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 101,

(1, 3, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 110, and

(3, 1, π) if the encoder is in state 3, state bit (B_A) equals 0, and the modulation bits (B_B) equal 111.

24. The system of claim 16, wherein

the encoder receives one state bit (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 000,

(2, 3, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 001,

(0, 3, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 010,

(2, 1, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 011,

(1, 0, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 100,

(3, 2, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 101,

(1, 2, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 110,

(3, 0, 0) if the encoder is in state 4, state bit (B_A) equals 1, and the modulation bits (B_B) equal 111,

(0, 0, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 000,

(2, 2, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 001,

(0, 2, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 010,

(2, 0, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 011,

(1, 1, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 100,

(3, 3, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 101,

(1, 3, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 110, and

(3, 1, π) if the encoder is in state 4, state bit (B_A) equals 0, and the modulation bits (B_B) equal 111.

25. The system of claim 16, wherein

the encoder receives one state bit (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0000,

(4, 4, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0001,

(0, 4, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0010,

(4, 0, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0011,

(2, 2, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0100,

(6, 6, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0101,

(2, 6, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0110,

(6, 2, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0111,

(0, 2, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1000,

(4, 6, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1001,

(0, 6, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1010,

(4, 2, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1011,

(2, 4, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1100,

(6, 0, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1101,

(2, 0, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1110,

(6, 4, 0) if the encoder is in state 1, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1111,

(1, 1, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0000,

(5, 5, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0001,

(1, 5, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0010,

(5, 1, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0011,

(3, 3, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0100,

(7, 7, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0101,

(3, 7, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0110,

(7, 3, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0111,

(1, 3, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1000,

(5, 7, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1001,

(1, 7, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1010,

(5, 3, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1011,

(3, 1, π) if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1100,

$(7, 5, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1101,

$(3, 5, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1110, and

$(7, 1, \pi)$ if the encoder is in state 1, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1111.

26. The system of claim 16, wherein

the encoder receives one state bit (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

$(0, 0, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0000,

$(4, 4, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0001,

$(0, 4, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0010,

$(4, 0, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0011,

$(2, 2, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0100,

$(6, 6, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0101,

$(2, 6, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0110,

$(6, 2, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0111,

$(0, 2, 0)$ if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1000,

(4, 6, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1001,

(0, 6, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1010,

(4, 2, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1011,

(2, 4, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1100,

(6, 0, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1101,

(2, 0, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1110,

(6, 4, 0) if the encoder is in state 2, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1111,

(1, 1, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0000,

(5, 5, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0001,

(1, 5, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0010,

(5, 1, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0011,

(3, 3, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0100,

(7, 7, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0101,

(3, 7, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0110,

(7, 3, π) if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0111,

$(1, 3, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1000,

$(5, 7, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1001,

$(1, 7, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1010,

$(5, 3, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1011,

$(3, 1, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1100,

$(7, 5, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1101,

$(3, 5, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1110, and

$(7, 1, \pi)$ if the encoder is in state 2, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1111.

27. The system of claim 16, wherein

the encoder receives one state bit (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

$(1, 1, 0)$ if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0000,

$(5, 5, 0)$ if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0001,

$(1, 5, 0)$ if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0010,

$(5, 1, 0)$ if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0011,

(3, 3, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0100,

(7, 7, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0101,

(3, 7, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0110,

(7, 3, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0111,

(1, 3, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1000,

(5, 7, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1001,

(1, 7, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1010,

(5, 3, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1011,

(3, 1, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1100,

(7, 5, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1101,

(3, 5, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1110,

(7, 1, 0) if the encoder is in state 3, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0010,

(4, 0, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0011,

(2, 2, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0100,

(6, 6, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0101,

(2, 6, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0110,

(6, 2, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0111,

(0, 2, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1000,

(4, 6, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1001,

(0, 6, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1010,

(4, 2, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1011,

(2, 4, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1100,

(6, 0, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1101,

(2, 0, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1110, and

(6, 4, π) if the encoder is in state 3, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1111.

28. The system of claim 16, wherein

the encoder receives one state bit (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(1, 1, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0000,

(5, 5, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0001,

(1, 5, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0010,

(5, 1, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0011,

(3, 3, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0100,

(7, 7, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0101,

(3, 7, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0110,

(7, 3, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 0111,

(1, 3, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1000,

(5, 7, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1001,

(1, 7, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1010,

(5, 3, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1011,

(3, 1, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1100,

(7, 5, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1101,

(3, 5, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1110,

(7, 1, 0) if the encoder is in state 4, the state bit (B_A) equals 0, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0010,

(4, 0, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0011,

(2, 2, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0100,

(6, 6, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0101,

(2, 6, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0110,

(6, 2, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 0111,

(0, 2, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1000,

(4, 6, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1001,

(0, 6, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1010,

(4, 2, π) if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1110, and

$(6, 4, \pi)$ if the encoder is in state 4, the state bit (B_A) equals 1, and the modulation bits (B_B) equal 1111.

29. The system of claim 15, wherein

space-time block code $C(X_1, X_2, 0)$ is associated with state 1,

space-time block code $C(X_1, X_2, \pi/2)$ is associated with state 2,

space-time block code $C(X_1, X_2, \pi)$ is associated with state 3, and

space-time block code $C(X_1, X_2, 3\pi/2)$ is associated with state 4.

30. The system of claim 29, wherein

the encoder receives two state bits (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

$(0, 1, 0)$ if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

$(4, 5, 0)$ if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

$(0, 5, 0)$ if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

$(4, 1, 0)$ if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

$(2, 3, 0)$ if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

(7, 0, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

$(4, 0, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

$(2, 2, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

$(6, 6, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

$(2, 6, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

$(6, 2, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

$(0, 2, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

$(4, 6, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

$(0, 6, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, 3\pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

(1, 5, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

31. The system of claim 29, wherein

the encoder receives two state bits (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

(7, 0, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, π) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

$(1, 5, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

$(5, 1, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

$(3, 3, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

$(7, 7, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

$(3, 7, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

$(7, 3, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

$(1, 3, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

$(5, 7, 3\pi/2)$ if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

32. The system of claim 29, wherein

the encoder receives two state bits (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

(7, 0, π/2) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, π) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

$(2, 2, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

$(6, 6, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

$(2, 6, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

$(6, 2, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

$(0, 2, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

$(4, 6, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

$(0, 6, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, 3\pi/2)$ if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

$(1, 5, 3\pi/2)$ if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

33. The system of claim 29, wherein

the encoder receives two state bits (B_A) and three modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, $\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, π/2) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, π/2) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

(7, 0, π/2) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

(4, 2, π) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

$(1, 5, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

$(5, 1, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

$(3, 3, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

$(7, 7, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

$(3, 7, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

$(7, 3, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

$(1, 3, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

$(5, 7, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

$(1, 7, 3\pi/2)$ if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

34. The system of claim 8, wherein

the encoder implements an eight-state trellis code.

35. The system of claim 34, wherein

space-time block code $C(X_1, X_2, 0)$ is associated with state 1,

space-time block code $C(X_1, X_2, \pi/2)$ is associated with state 2,

space-time block code $C(X_1, X_2, \pi)$ is associated with state 3,

space-time block code $C(X_1, X_2, 3\pi/2)$ is associated with state 4,

space-time block code $C(X_1, X_2, 0)$ is associated with state 5,

space-time block code $C(X_1, X_2, \pi/2)$ is associated with state 6,

space-time block code $C(X_1, X_2, \pi)$ is associated with state 7, and

space-time block code $C(X_1, X_2, 3\pi/2)$ is associated with state 8.

36. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

(4, 2, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

(2, 4, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

(6, 0, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

(2, 0, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

(6, 4, 0) if the encoder is in state 1, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

$(1, 5, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

$(5, 1, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

$(3, 3, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

$(7, 7, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

$(3, 7, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

$(7, 3, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

$(1, 3, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

$(5, 7, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

$(1, 7, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

$(5, 3, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

$(3, 1, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

$(7, 5, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

$(3, 5, \pi/2)$ if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110,

(7, 1, $\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111,

(0, 1, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, π) if the encoder is in state 1, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, 3π/2) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110, and

(7, 0, $3\pi/2$) if the encoder is in state 1, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111.

37. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

(4, 2, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

(2, 4, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

(6, 0, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

(2, 0, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

(6, 4, 0) if the encoder is in state 2, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

(1, 1, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

(5, 5, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

(1, 5, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110,

(7, 1, $\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111,

(0, 1, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, π) if the encoder is in state 2, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110, and

(7, 0, $3\pi/2$) if the encoder is in state 2, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111.

38. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_o, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

(4, 2, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

(2, 4, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

(6, 0, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

(2, 0, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

(6, 4, 0) if the encoder is in state 3, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

(1, 1, π/2) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

(5, 5, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

(1, 5, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110,

(7, 1, $\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111,

$(0, 1, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

$(4, 5, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

$(0, 5, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

$(4, 1, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

$(2, 3, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

$(6, 7, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

$(2, 7, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

$(6, 3, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

$(0, 3, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

$(4, 7, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

$(0, 7, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

$(4, 3, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

$(2, 1, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

$(6, 5, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

$(2, 5, \pi)$ if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, π) if the encoder is in state 3, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110, and

(7, 0, $3\pi/2$) if the encoder is in state 3, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111.

39. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 0, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

(4, 2, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

(2, 4, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

(6, 0, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

(2, 0, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

(6, 4, 0) if the encoder is in state 4, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

(1, 1, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

(5, 5, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

(1, 5, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110,

(7, 1, π/2) if the encoder is in state 4, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111,

(0, 1, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, π) if the encoder is in state 4, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110, and3\

(7, 0, $3\pi/2$) if the encoder is in state 4, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111.

40. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 5, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

$(1, 4, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

$(5, 0, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

$(3, 2, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

$(7, 6, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

$(3, 6, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

$(7, 2, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

$(1, 2, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

$(5, 6, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

$(1, 6, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

$(5, 2, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

$(3, 0, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

$(7, 4, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

$(3, 4, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

$(7, 0, \pi/2)$ if the encoder is in state 5, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

$(0, 0, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

$(4, 4, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

$(0, 4, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

$(4, 0, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

$(2, 2, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

$(6, 6, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

$(2, 6, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

$(6, 2, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

$(0, 2, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

$(4, 6, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

$(0, 6, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 5, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

(1, 1, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

(5, 5, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

(1, 5, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, $3\pi/2$) if the encoder is in state 5, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

41. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 6, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $\pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

($1, 6, \pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

($5, 2, \pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

($3, 0, \pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

($7, 4, \pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

($3, 4, \pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

($7, 0, \pi/2$) if the encoder is in state 6, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

($0, 0, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

($4, 4, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

($0, 4, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

($4, 0, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

($2, 2, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

($6, 6, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

($2, 6, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

($6, 2, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

($0, 2, \pi$) if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

$(4, 6, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

$(0, 6, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 6, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

$(1, 5, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

$(5, 1, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

$(3, 3, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

$(7, 7, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

$(3, 7, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

$(7, 3, 3\pi/2)$ if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, 3π/2) if the encoder is in state 6, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

42. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 7, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $\pi/2$) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $\pi/2$) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $\pi/2$) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

(7, 0, π/2) if the encoder is in state 7, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

$(0, 4, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

$(4, 0, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

$(2, 2, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

$(6, 6, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

$(2, 6, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

$(6, 2, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

$(0, 2, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

$(4, 6, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

$(0, 6, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 7, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

(5, 5, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

(1, 5, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

(5, 1, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

(3, 3, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

(7, 7, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

(3, 7, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

(7, 3, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

(1, 3, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

(5, 7, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, 3π/2) if the encoder is in state 7, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

43. The system of claim 35, wherein

the encoder receives two state bits (B_A) and four modulation bits (B_B) at a time T_0, and

the transmission variables (X_1, X_2, Θ) equal:

(0, 1, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0000,

(4, 5, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0001,

(0, 5, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0010,

(4, 1, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0011,

(2, 3, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0100,

(6, 7, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0101,

(2, 7, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0110,

(6, 3, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 0111,

(0, 3, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1000,

(4, 7, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1001,

(0, 7, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1010,

(4, 3, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1011,

(2, 1, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1100,

(6, 5, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1101,

(2, 5, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1110,

(6, 1, 0) if the encoder is in state 8, the state bits (B_A) equal 10, and the modulation bits (B_B) equal 1111,

(1, 0, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0000,

(5, 4, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0001,

(1, 4, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0010,

(5, 0, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0011,

(3, 2, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0100,

(7, 6, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0101,

(3, 6, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0110,

(7, 2, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 0111,

(1, 2, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1000,

(5, 6, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1001,

(1, 6, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1010,

(5, 2, $\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1011,

(3, 0, π/2) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1100,

(7, 4, π/2) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1101,

(3, 4, π/2) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1110,

(7, 0, π/2) if the encoder is in state 8, the state bits (B_A) equal 11, and the modulation bits (B_B) equal 1111,

(0, 0, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0000,

(4, 4, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0001,

(0, 4, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0010,

(4, 0, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0011,

(2, 2, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0100,

(6, 6, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0101,

(2, 6, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0110,

(6, 2, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 0111,

(0, 2, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1000,

(4, 6, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1001,

(0, 6, π) if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1010,

$(4, 2, \pi)$ if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1011,

$(2, 4, \pi)$ if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1100,

$(6, 0, \pi)$ if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1101,

$(2, 0, \pi)$ if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1110,

$(6, 4, \pi)$ if the encoder is in state 8, the state bits (B_A) equal 00, and the modulation bits (B_B) equal 1111,

$(1, 1, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0000,

$(5, 5, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0001,

$(1, 5, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0010,

$(5, 1, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0011,

$(3, 3, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0100,

$(7, 7, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0101,

$(3, 7, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0110,

$(7, 3, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 0111,

$(1, 3, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1000,

$(5, 7, 3\pi/2)$ if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1001,

(1, 7, $3\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1010,

(5, 3, $3\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1011,

(3, 1, $3\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1100,

(7, 5, $3\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1101,

(3, 5, $3\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1110, and

(7, 1, $3\pi/2$) if the encoder is in state 8, the state bits (B_A) equal 01, and the modulation bits (B_B) equal 1111.

44. A telecommunications system, comprising:

a receiver having a decoder that decodes a multi-state trellis code; and

at least one receiver element coupled to the receiver,

wherein, during operation, the decoder decodes received information signals encoded using at least two orthogonal space-time block codes of a form

$$C(x_1, x_2, \theta) = \begin{pmatrix} x_1 e^{j\theta} & x_2 \\ -x_2^* e^{j\theta} & x_1^* \end{pmatrix} .$$

45. A telecommunications system, comprising:

a receiver having a decoder that decodes a multi-state trellis code; and

at least one receiver element coupled to the receiver,

wherein, during operation, the decoder decodes received information signals encoded using at least two orthogonal space-time block codes of a form

$$C(x_1, x_2, \theta) = \begin{pmatrix} x_1 e^{j\theta} & x_2 e^{j\theta} \\ -x_2^* & x_1^* \end{pmatrix}.$$

46. The system of claim 44, wherein the at least one receiver element is an antenna.

47. The system of claim 44, wherein the at least one receiver element is an optical receiver.

48. A method for designing a full-diversity code, comprising the steps of:

(1) selecting a rate for the diverse transmission scheme;

(2) selecting a number of states for the code;

(3) selecting a super-orthogonal space-time trellis structure having the number of states selected in step (2);

(4) selecting a super-orthogonal space-time set partitioning structure that corresponds to the rate selected in set (1); and

(5) assigning values to a set of transmission variable in accordance with the super-orthogonal space-time trellis structure selected in step (3) and the super-orthogonal space-time set partitioning structure selected in step (4).